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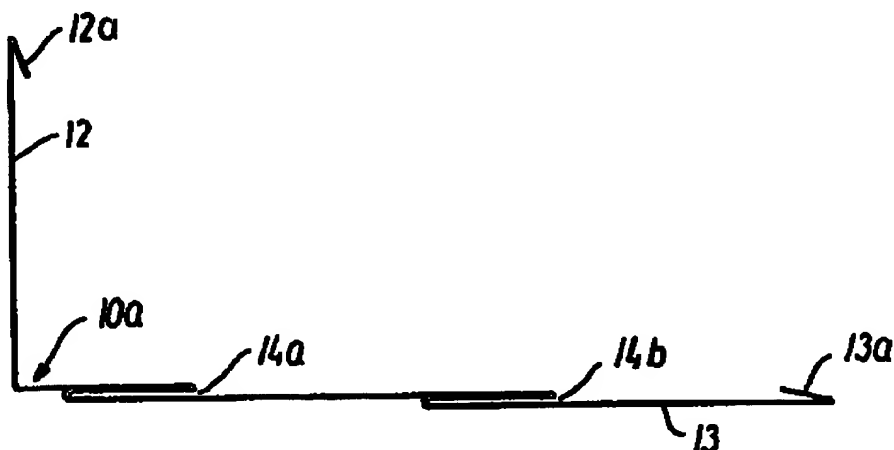
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/DK95/00149</p> <p>(22) International Filing Date: 7 April 1995 (07.04.95)</p> <p>(30) Priority Data: 0444/94 18 April 1994 (18.04.94) DK 08/319,529 7 October 1994 (07.10.94) US</p> <p>(71) Applicant: V. KANN RASMUSSEN INDUSTRI A/S [DK/DK]; Tobaksvejen 10, DK-2860 Søborg (DK).</p> <p>(72) Inventors: MORTENSEN, Bent, René; Villeshøj Skovgyde 108, DK-5210 Odense NV (DK). VEDEL, Ole, Michael; Vinkelvej 4, DK-3480 Frederiksberg (DK). ALKJÆR, Peter; Ringerødøden 9, DK-2605 Brøndby (DK).</p> <p>(74) Agents: RAFFNSØE, Knud, Rosenstand et al.; Internationalt Patent-Bureau, Høje Taastrup Boulevard 23, DK-2630 Taastrup (DK).</p>		<p>(81) Designated States: AM, AT, AU, BE, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).</p> <p>Published With international search report.</p>

(54) Title: A FLASHING FOR ROOF ELEMENTS

(57) Abstract

A flashing arrangement for mounting of a roof element in a roof having a thin sheet-formed roofing comprises flashing elements for connection with the main frame members and is made from a sheet material. The flashing elements intended for connection with the side members of the main frame are of a substantially L-shaped cross section with an upright flange portion for bearing against the side member of the main frame and a flange portion protruding substantially parallel to the roof surface. The protruding flange portion is folded to form at least one slot in its longitudinal direction, said slot having an opening facing away from the main frame side member for receiving an edge portion of the thin sheet-formed roofing.



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A flashing for roof elements

The invention relates to a flashing arrangement for mounting of a roof element in a roof having a thin sheet-formed roofing, in particular a roof window having a mainly rectangular main frame composed of a top member, two side members and a bottom member, said flashing arrangement comprising flashing elements for connection with the main frame members and made from a sheet material, flashing elements intended for connection with the side members of the main frame being of a substantially L-shaped cross-section with an upright flange portion for bearing against the side member of the main frame and a flange portion protruding substantially parallel to the roof surface.

When mounting windows in inclined roofs it is important that a water- and weathertight connection between the main frame structure of the window and the surrounding roofing be provided. This connection is, dependent on the nature of the roofing, in different ways inserted under the roofing and may comprise sealing means for bearing against the underside thereof. It is further necessary that the roofing may be securely connected to the roof element or the window construction so that there will be no risk that the roofing around the built-in roof element will lift from the supporting construction of the roof influenced by e.g. a strong wind.

Thus it is known to provide windows, which are built-in in a roof having a corrugated roofing, e.g. from tiles, with a connection in the form of a flashing comprising a weather strip. Due to the rather high dead load of the tiles the roofing bears against the weather strip and thereby against the roof construction thus securing a water- and weathertight connection as well

as a safe fastening between the roofing and the roof construction. With substantially plane roofings, such as slates and the like, where it is a question of small elements of great rigidity the possibility exists to
5 fasten them near the flashing.

Using light roofings in long lengths it is rather more difficult to secure a tight connection and a safe fastening. This is the case e.g. in roofings made from a thin metal sheet which in various ways may be profiled
10 in the direction of inclination of the roof. In such cases the roofing has formerly been secured by means of methods such as glueing or puttying which entails a difficult mounting of the flashing as well as a far more insecure fastening and sealing.

15 From SU patent specification No. 897894 a protective and insulating apron is known comprising a vertical part for attachment to the wall of a roof penetrating superstructure and an adjoining horizontal part forming a single fold adapted to receive the edge of a roofing
20 material.

By means of such an apron arrangement a good tightness between the superstructure and the surrounding roofing as well as a secure fastening of the latter to the underlying roof construction are attained. Further
25 the apron arrangement may be easily connected with the main frame structure and the roofing.

As the opening of the slot faces away from the superstructure an easy mounting of the apron arrangement with respect to the surrounding roofing is also
30 obtained.

Moreover, as a result of forming of the slot by folding the protruding flange portion of the horizontal member allows the apron to be made in one piece which makes the production cheaper and easier.

On the background hereof it is the object of the invention to provide a flashing which not only remedies the above mentioned drawbacks by providing the same advantages as the above-mentioned prior art apron, but which is, in addition, more easily mountable in connection with roofings made from thin metal sheets, independent of the profile thereof.

According to a first aspect of the invention a flashing arrangement of the kind defined above is characterized in that said protruding flange portion is folded in its longitudinal direction to form at least two mutually separated and mainly parallel slots, said slots having openings facing away from the main frame side member for receiving an edge portion of the thin sheet-formed roofing.

In connection with roofings having varying profile shape such as a trapezoidal or rib-like shape the invention offers the advantage of a suitable overlap between the flashing elements and the edge portion of the roofing, independent of the shape of the roofing.

According to a second aspect of the invention the same advantages are obtained in a flashing arrangement of the kind defined which is characterized in that said protruding flange portion comprises a first part forming an integral part of the upright flange portion and a second part for connection with said first part, said second part being provided with a slot for receiving the edge portion of said roofing.

Further details and advantages in the flashing arrangement according to the invention will appear from the subclaims.

In the following the invention will be further explained with reference to the schematical drawing, in which

Fig 1 is a perspective view of a window which is built-in in a profiled metal roof, and which is surrounded by a flashing arrangement according to the invention,

5 Fig 2 in a larger scale is a view of a detail of the flashing arrangement according to the invention,

Fig 3 in a larger scale is a view of another detail of the flashing arrangement according to the invention,

Fig 4 is a cross-sectional view along the line IV-
10 IV of Fig 1,

Fig 5 is a view as in Fig 4, but the profile of the metal roofing being different, and

Fig 6 in a larger scale is a view of a detail of the flashing arrangement according to another embodiment
15 of the invention.

The window 1 shown in Fig 1 is in the form of a skylight and is built-in in an inclined roof having a roofing 2 made from thin metal sheets 2a with a profile 3 extending in the direction of inclination of the roof,
20 said profile comprising flat bottom portions 2b and upright ribs 2c, 2d (cf. Fig 4). The window comprises a pane 4, a glass-carrying window frame 5 and a main frame 6 composed of a top member 6a, a bottom member 6b and two side members 6c, 6d. The main frame 6 is connected
25 to the roofing 2 by means of a flashing arrangement 7 which on one side is inserted under the cladding 8 of the main frame and on the other side is connected to the roofing 2 so that water and other downpour cannot penetrate under it.

30 The flashing arrangement 7 comprises an upper element 9 for connection with the top member 6a of the main frame which constitutes a gutter at the top of the window, two side elements 10a, 10b for connection with the side members 6c, 6d of the main frame and a bottom
35 element 11 for connection with the bottom member 6b of

the main frame. The bottom element 11 is at the sides provided with an upright flange 11b and with a flange portion 11a protruding in the plane of the roofing which when mounted is adapted to be overlapped by corresponding flange portions on the side elements 10a, 10b of the flashing arrangement. The element 11 further comprises a front edge 11c and a plastically deformable skirt 11d which may be made from lead or other deformable material. The skirt 11d is placed on top of the underlying roofing 2 and is sealingly formed against same. The element 9 is provided with side sections extending outwards in the extension of the gutter and comprising in the mounted position of the gutter an upright flange portion 9b and a flange portion 9a protruding in the plane of the roofing and on each side of the top member 6a of the main frame overlapping the side portions 10a, 10b of the flashing arrangement 7. Water collected in the gutter of the upper element 9 is conducted round the upper corners of the main frame, down along the side members 6c, 6d of the main frame, over the front edge 11c and the skirt 11d and out on the roofing 2.

In Fig 2 one of the side elements 10a of the flashing arrangement is shown having a substantially L-shaped cross-section where an upright flange portion 12 having a turned-in flap 12a is adapted to be inserted under the cladding 8 of the main frame and to be fastened to the side member 6c of the main frame (cf. Fig 4). A protruding flange portion 13, which when mounted is parallel to the roof surface, is in the shown embodiment provided with a first 14a and a second 14b longitudinally extending slot by means of two subsequent foldings. The slots 14a, 14b have openings facing away from the window 1 and are adapted to receive and fasten an edge portion 15 shown in Fig 4 of the metal sheet of

the roofing 2 closest to the window. Dependent on the positioning of the ribs of the profile 3 of the roofing in relation to the window, the metal sheet may be engaged in either one or the other of these slots. At
5 its end the protruding flange portion 13 is adapted to fasten the side member 10a to the underlying roof construction by means of fastening cleats or clips, not shown, and is further provided with a turned-in flap 13a forming a stop for water penetration under the roofing
10 when mounting the flashing.

In Fig 3 it is shown how the flashing element 9 for connection with the top member of the main frame and to form a gutter is connected to the flashing element 10a at the side member of the main frame. At the ends the
15 element 9 is provided with an upright flange portion 9b and a protruding 9a flange portion which overlap the corresponding flange portions 12,13 of the flashing element 10a. For this purpose the protruding flange portion 9a is provided with two slots corresponding to
20 the slots 14a,14b. The connection, not shown, between the side elements 10a,10b and the bottom flashing element 11 is brought about in a similar manner by providing the protruding flange portion 11a of this element 11 with two slots.

25 In Fig 4 a section through the window 1 with the flashing arrangement 7 and a rib-profiled roofing 2 is shown, in which it is shown, in solid lines, how the edge portion 15 of the flat bottom portion 2b of the roofing 2 has been inserted into the first slot 14a of
30 the side element of the flashing arrangement. In dotted lines, it is shown how the edge portion of the metal sheet can be inserted into the other slot 14b in another positioning of the ribs of the profile 3. The metal sheets constituting the roofing are here composed of
35 sheets 2a extending in the direction of inclination of

the roof and having a U-shaped cross-section comprising a flat bottom portion 2b and upright rib flanges 2c, 2d at the opposite lateral edges, of which the one 2d is provided with a folding for engaging the other upright flange 2c of the neighbouring plate, whereby two adjacent plates are locked together by snap engagement.

Fig 5 shows a roofing where the profile is in the form of a trapezoidal plate 2a' having flat, longitudinal bottom portions 2b' and upright flanges 2c', 2d' being upwards diverging and at the top being connected to the flange of the adjacent portion by means of a top portion 2e'. As shown, the top and bottom portions may be of equal width, but it is, of course, also possible that one of the portions is smaller than the other. In full-drawn line it is shown how a section of a bottom portion of the trapezoidal form is inserted into the other slot 14b of the side element 10a of the flashing, while in dotted line another bottom portion inserted into the first slot 14a is shown. The distance between the openings of the slots 14a and 14b is 10-15 mm greater than the distance between two adjacent bottom portions of the profile 3 of the roofing in order to secure a suitable overlap between the roofing and the flashing, it being possible during mounting to cut one of the flat bottom portions in such a way that a border portion thereof may always be inserted into the first or the second slot.

Fig 6 shows another embodiment of the side element 10a of the flashing, in which the upright flange portion 12 including the turned-in flap 12a is designed as in the embodiment shown in Fig 2. The protruding flange portion 13, on the other hand, is divided into two and comprises a first part 20 formed integrally with the upright flange portion 12 and a second part 22 in the shape of an adapter piece 22 including the slot 14

intended for connection of the edge portion of the sheet-like roofing with said first part 20. The adapter piece 22 is connected to the first part 20 in that a flat edge portion 23 thereof is inserted into a slot 21 5 in the first part 20 having the same shape and being formed in the same way as the slot 14. Further, as in the embodiment illustrated in Fig 2, the adapter piece 22 comprises a turned-in flap 13a forming a stop for penetration of water under the roofing.

10 The adaption to various shapes of the roofing is carried out in that the flat edge portion 23 of the adapter piece 22 is cut off at a suitable distance from the slot 14. It is further possible that the slot 21 of the first part 20 may constitute the receiving slot for 15 the edge portion of the roofing. To this purpose the first part 20 is at its outer edge provided with a turned-in flap 13a' which when using the adapter piece 22 is bent completely down onto the upper side of the outer edge of said first part, the outer edge 20 hereinafter being secured to the underlying roof structure prior to the adapter piece 22 being inserted into the slot 21 and the edge portion of the roofing finally being inserted into the slot 14. This increases the strength of the securing of the roofing to the 25 underlying roof structure.

Moreover, this embodiment of the flashing side element 10a can be used as a flashing element at the main frame bottom member 6b. In this case the side element 10a with its upright flange portion 12 is 30 inserted under the cladding of the main frame and fastened to the main frame. A flat connecting piece having a length corresponding to the width of the window is placed below the main frame bottom member and an upper longitudinal portion of the connecting piece is 35 inserted into the slot 14 of the first part 20 and the

opposite longitudinal portion is placed over the roofing. It is, of course, possible to make use of the adapter piece 22 for adapting the flashing to different distances between the bottom member of the main frame 5 and the roofing below the window. The side element 10a being used as a flashing element at the bottom member of the main frame together with the flat connecting piece and possibly in connection with the adapter piece entails the advantage that the skirt 11d can be totally disposed of.

The flashing may also be made from synthetic material, such as plastic or rubber, where the individual parts may be glued in the overlaps or they may be welded together.

15 The flashing arrangement according to the invention is useable in connection with roof elements which are to pass through the sheet-formed roofing. Examples of such roof elements are skylights, roof windows being fixed or openable, solar collectors, chimneys, ventilat-
20 ing pipes or erections.

P A T E N T C L A I M S

1. A flashing arrangement for mounting of a roof element in a roof having a thin sheet-formed roofing (2), in particular a roof window having a mainly rectangular main frame (6) composed of a top member, two side members and a bottom member, said flashing arrangement comprising flashing elements (9,10a,10b,11) for connection with the main frame members and made from a sheet material, flashing elements intended for connection with the side members of the main frame being of a substantially L-shaped cross-section with an upright flange portion (12) for bearing against the side member of the main frame and a flange portion (13) protruding substantially parallel to the roof surface, characterized in that said protruding flange portion (13) is folded in its longitudinal direction to form at least two mutually separated and mainly parallel slots (14a,14b), said slots having openings facing away from the main frame side member for receiving an edge portion (15) of the thin sheet-formed roofing.
2. A flashing arrangement according to claim 1, in particular for use in connection with roofings having a trapezoidal or rib-like profile shape, characterized in that the mutual separated openings of said slots (14a,14b) is adapted to the profile shape (3) of the roofing in such a way as to permit said edge portion (15) of the roofing to be received in one of the slots independent of the shape of the roofing.
3. A flashing arrangement according to claim 2, characterized in that the separation of the openings of said slots is approximately 10-15 mm greater than the distance between two adjacent flat bottom portions (2b,2b') of the profile shape of the roofing.
4. A flashing arrangement for mounting of a roof element in a roof having a thin sheet-formed roofing

(2), in particular a roof window having a mainly rectangular main frame (6) composed of a top member, two side members and a bottom member, said flashing arrangement comprising flashing elements (9,10a,10b,11) for
5 connection with the main frame members and made from a sheet material, flashing elements intended for connection with the side members of the main frame being of a substantially L-shaped cross-section with an upright flange portion (12) for bearing against the side member
10 of the main frame and a flange portion (13) protruding substantially parallel to the roof surface, characterized in that said protruding flange portion (13) comprises a first part (20) forming an integral part of the upright flange portion (12) and a second part (22)
15 for connection with said first part (20), said second part being provided with a slot (14) for receiving the edge portion (15) of said roofing.

5. A flashing arrangement according to claim 4, characterized in that said second part (22) forms an
20 adapter piece with a flat portion (23) intended to be received in a slot (21) in said first part (20), said slot (21) having an opening facing away from the main frame side member, and wherein the width of said flat portion (23) is intended to be adapted in such a way
25 that the edge portion of the roofing may be received in the slot of said second part independent of the shape of the roofing.

6. A flashing arrangement according to any of the preceding claims, characterized in that an outer edge
30 portion of the protruding flange portion (13) intended to be positioned under the roofing is provided with a turned-in flap (13a) to stop water penetration under the roofing.

7. A flashing arrangement according to any of the
35 preceding claims, characterized in that a flashing

element (9) for connection with the top member of the main frame for formation of a top gutter is provided at the ends thereof with upright (9b) and protruding (9a) flange portions adapted to overlap the corresponding
5 flange portions (12,13) of the flashing elements (10a,10b) connected to the side members of the main frame during mounting of the flashing arrangement.

8. A flashing arrangement according to any of the preceding claims, characterized in that a flashing
10 element (11) for connection with the bottom member of the main frame is provided at the ends thereof with upright (11b) and protruding (11a) flange portions adapted to be overlapped by the corresponding flange portions (12,13) of the flashing elements (10a,10b)
15 connected to the side members of the main frame during mounting of the flashing arrangement.

9. A flashing arrangement according to claim 8, characterized in that the flashing element (11) for connection with the bottom member is connected at a
20 lower part of its protruding flange portion with a skirt (11d) made from a plastically deformable material and of a width sufficient for covering part of the underlying roofing to be sealingly formed against same.

10. A flashing arrangement according to any of the
25 preceding claims, characterized in that the flashing elements are made from metal sheet.

11. A flashing arrangement according to any of claims 1 to 9, characterized in that the flashing elements are made from synthetic materials.

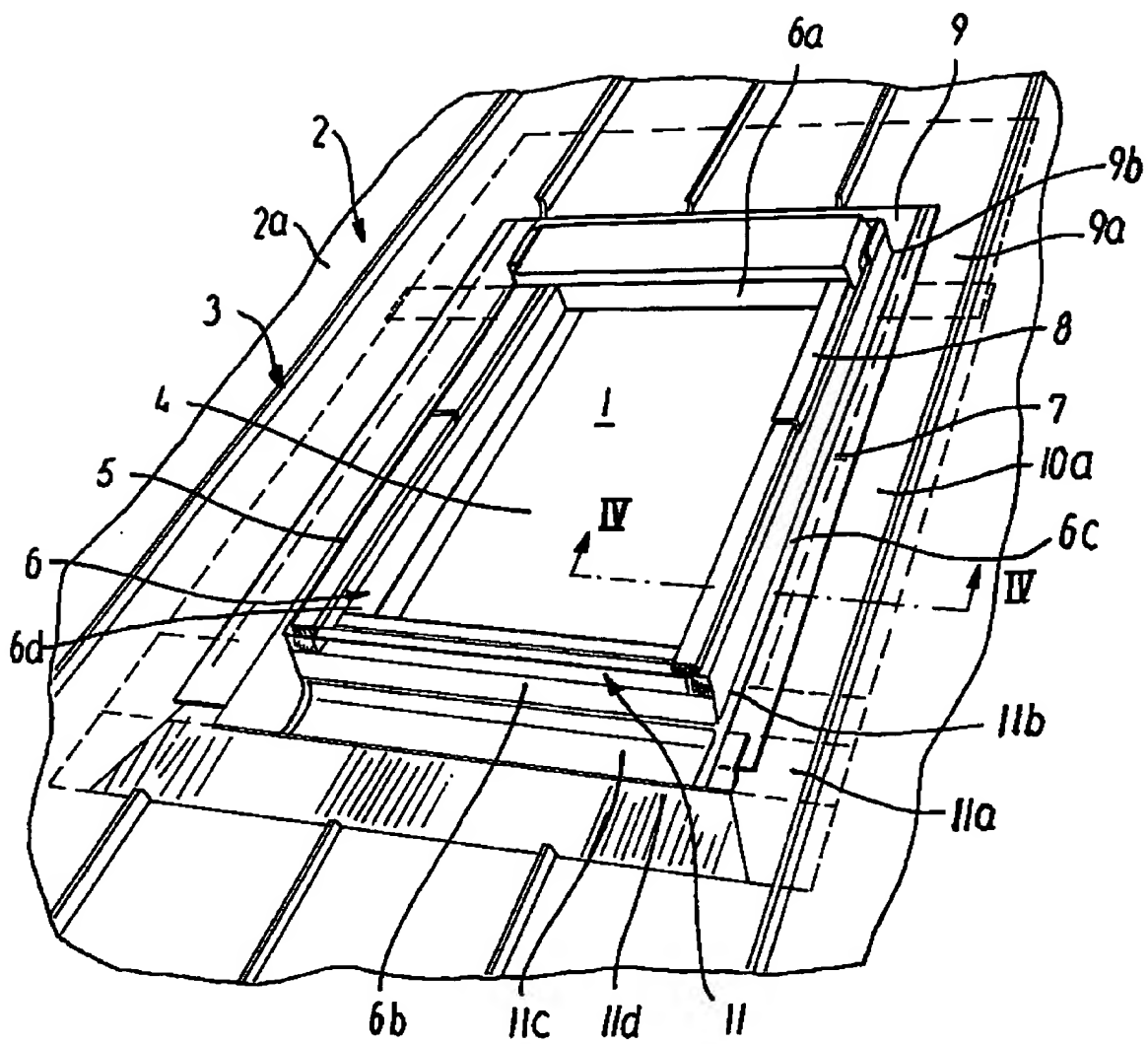


FIG. 1

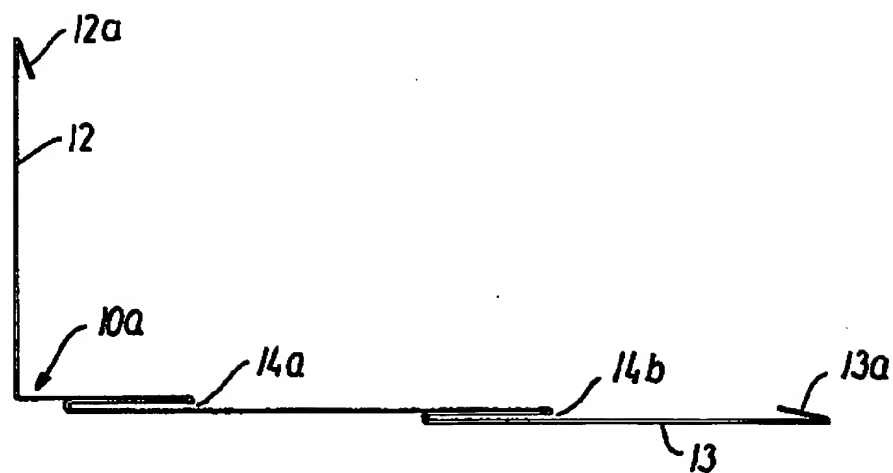


FIG. 2

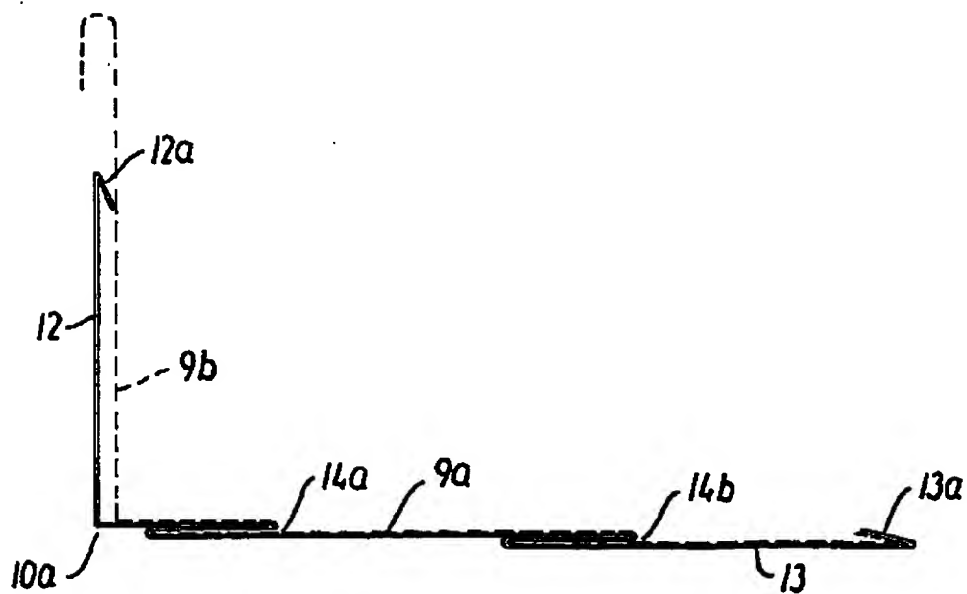


FIG. 3

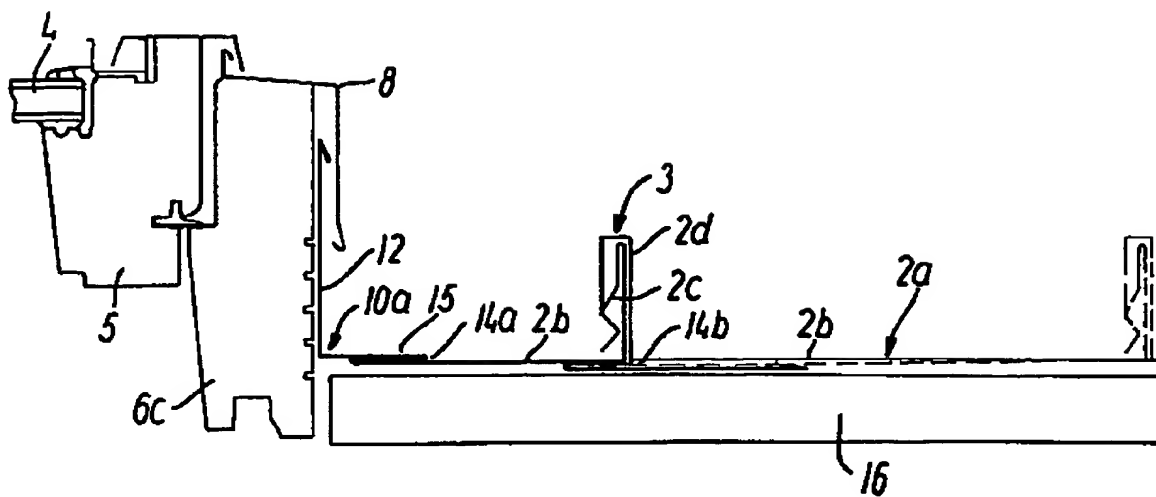


FIG. 4

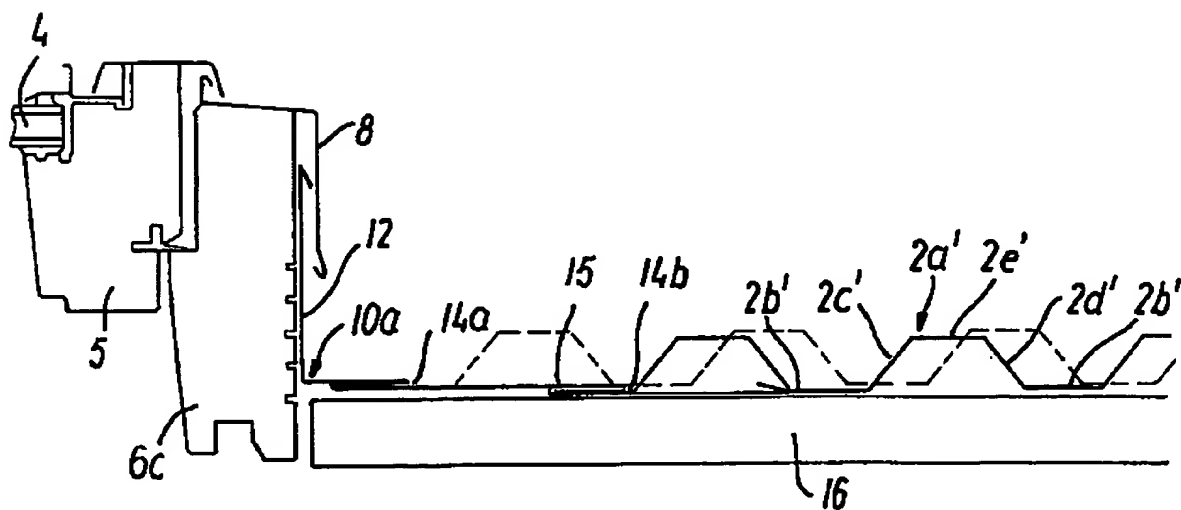


FIG. 5

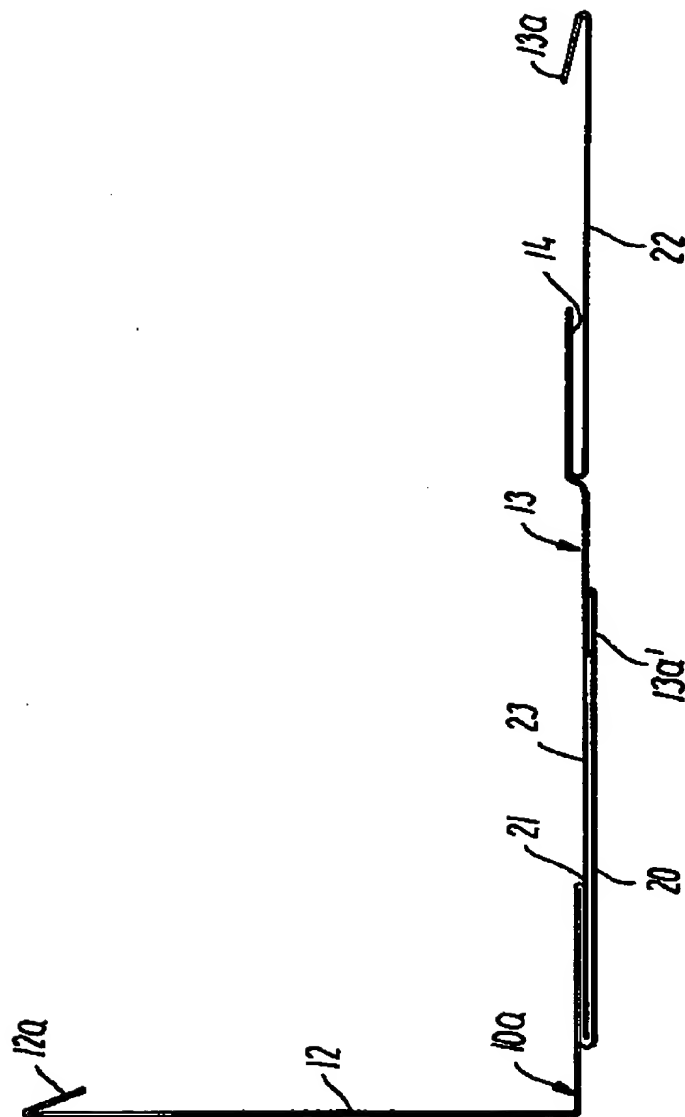


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 95/00149

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: E04D 13/02 // E04D 13/14

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent's abstract, No A5073 J/48, week 8248, ABSTRACT OF SU, 897984 (EREV POLY), 15 January 1982 (15.01.82), details 1,5 --	1-10
A	DE, B2, 2142733 (HOESCH WERKE AG), 6 July 1978 (06.07.78), figure 4, detail 12 --	1-10
A	DE, A1, 2910553 (VETTER, L.), 25 Sept 1980 (25.09.80), figure 3, details 56,58 --	1-10
A	DE, A1, 4032058 (V. KANN RASMUSSEN INDUSTRI A/S), 2 May 1991 (02.05.91), figure 3, detail 7 --	1-10

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 1105422 (S.M. GRIFFITHS), 28 July 1914 (28.07.14), figure 5, detail 9 --	1-10
A	US, A, 5065553 (S.J. MAGID), 19 November 1991 (19.11.91), figure 7, detail 11 -- -----	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

03/05/95

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-B2- 2142733	06/07/78	NONE	
DE-A1- 2910553	25/09/80	NONE	
DE-A1- 4032058	02/05/91	NONE	
US-A- 1105422	28/07/14	NONE	
US-A- 5065553	19/11/91	NONE	